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ABSTRACT

Two experiments investigated the effectiveness of reading backwards as a proofreading technique. Experiment 1 examined the general usefulness of backwards vs. forwards proofreading strategies and the effects of these strategies for two types of typographical errors: misspellings and contextual errors. Subjects, 36 undergraduate students at a California university, were asked to read four passages of 250 words containing 10 typographical errors distributed evenly throughout the passage. Results indicated that the backwards reading strategy was not shown to be an effective technique for proofreading, and, in fact, was actually inferior for detection of contextual errors. Experiment 2, using 18 undergraduates from another California university, examined the proofreading effectiveness of combining forwards and backwards reading by having subjects read each passage twice, sometimes using the backwards, sometimes the forwards strategy. Results indicated that the number of readings had a significant effect on error detection, but the type of strategy used did not. Major findings show that the backwards strategy was not shown by either experiment to be an effective proofreading strategy, and was actually inferior to forwards reading for detecting contextual errors, with no measurable benefits for detecting misspellings. A combination of reading forwards and backwards was found to be no more effective than reading forwards twice, and often required more time. (NKA)

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Is 'Backwards Reading' an Effective Proofreading Strategy?

by

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Experiment 1:

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Although numerous books have been published on proofreading (e.g., Butcher, 1981; Lasky, 1971; McNaughton, 1973), most are remarkably silent when it comes to possible techniques or strategies for proofreading. Determining the best strategies for proofreading would seem to be a straightforward enterprise for experimental psychologists. Yet little research has appeared in the psychological literature concerning this issue. There have been a few studies that have used proofreading tasks to study aspects of word recognition (e.g., Abramovici, 1983; Healy & Drewnowski, 1983). In addition, some applied psychologists have used proofreading as a measure of human performance, in an attempt to study the effects of environmental and task variables (e.g., Anderson & Revelle, 1982). Very few of these studies, however, provide any information that would be of practical use to someone wishing to improve their proofreading performance.

As a first step towards studying proofreading strategies, the experiments reported in this paper examine the effectiveness of one technique that is occasionally used by copy editors -- reading backwards (Adelstein & Pival, 1984; Hart & Hein, 1979; Kiefer, 1983; Sobolik, 1975; Solomon, 1985). Presumably, the benefit of this strategy is to eliminate the general context of the passage, forcing the proofreader to slow down and thus concentrate better on each individual word. As it turns out, there is some experimental support for the idea that some aspects of word analysis can be facilitated when context is removed or altered (Cohen, 1980; Holbrook, 1978; Morton, 1964; Schindler, 1978).

Experiment 1

The first experiment examines the general effectiveness of backwards vs. forwards reading strategies for proofreading. It also examines the effects of these strategies for two types of typographical errors: a) misspellings, in which a word becomes a nonword (soar → sonr) and b) contextual errors, in which a word becomes a new word,

but inappropriate for the context (soar ⟶ sour). Butcher (1981) warns that contextual errors are particularly likely to be missed by proofreaders, and Weinstein (1974, 1977) has shown that detection of such errors requires a broader range of context and cue utlilization.

It was hypothesized that misspellings would be detected better with the backwards strategy, since eliminating context and slowing the proofreader down should work best for this type of error. However, it was expected that backwards reading would be inferior for detecting contextual errors, due to the fact that contextual errors require knowledge of context to be detected accurately.

Method

Subjects. Subjects were 36 undergraduate students from psychology courses at California State University in Chico. Each subject received extra course credit for volunteering to be in the experiment.

Materials. Four passages were selected for the study from popular magazines and books. All passages were approximately 250 words in length. For each passage, ten typographical errors were distributed evenly throughout the passage so that no sentence contained more than one error. Five of these errors were misspellings, and five were contextual errors. To control for item differences, the same ten words in each passage were used to generate both misspellings and contextual errors. Thus, for each error, half of the subjects saw it as a misspelling and half saw it as a contextual error. This was counterbalanced across subjects for all of the errors.

Procedure. Subjects were run in groups ranging from three to eight students. Each subject read two of the four passages, chosen randomly for each subject. They were instructed to read the passages quickly but accurately, and to circle all the errors they could detect. They were also informed that the errors in the passages would consist of both misspellings and contextual errors.

For each of the two passages, subjects first read a version of the passage

containing no errors, to familiarize themselves with the content of the passage. Then they read the version of the passage with errors. For one of the two passages, subjects were instructed to read forwards; for the other passage, they were instructed to start with the last word in the passage and read backwards. The order of these two conditions was counterbalanced across subjects. Subjects were given 2.5 minutes to complete the forwards passage, and 3.5 minutes to complete the backwards passage. All subjects were able to finish within these times.

Table 1

Proportion of Errors Detected in Each of the Four Experimental Conditions in Experiment 1

	Forward Strategy	Backward Strategy
Misspellings	.84	.86
Contextual Errors	.63	.42

Results

Table 1 presents the proportion of errors detected in each of the four experimental conditions. A 2 X 2 repeated-measures ANOVA was conducted to analyze these data, which revealed that, as a whole, the forward strategy resulted in significantly better error detection than the backward strategy, $F(1,35) = 7.41$, $p<.05$. With regards to the main effect of error type, misspellings were detected significantly more often than contextual errors, $F(1,35) = 121.71$, $p<.01$.

Of particular interest, however, is the interaction between these two variables, which was also significant, $F(1,35) = 11.21$, $p<.01$. A post-hoc analysis revealed that the forward strategy was superior to the backward strategy for detecting contextual errors. However, for misspellings, no significant differences between the strategies was evident.

Discussion

The backwards reading strategy was not shown by this experiment to be an effective technique for proofreading. This strategy was actually inferior for error detection when the errors depended on context, and there was no significant difference between the strategies for detecting misspellings. In addition, subjects typically required more time to read the passages backwards, with no apparent benefit to error detection.

There are a few possibilities why the backward strategy may have been ineffective in this experiment. First, it should be pointed out that overall error detection was relatively high for the misspellings (85% detected). Because of this, any potential differences between the forward and backward strategies may have been masked to some extent by ceiling effects. Also, Experiment 1 explored the differences between forward and backward reading when each of these strategies was used **alone** for proofreading. It seems reasonable to suspect, however, that most people who proofread a passage backwards will do so only after first proofreading the same

passages forwards. Thus, the backward strategy might prove particularly useful when used as a **supplement** to forward proofreading, which was not explored in the first experiment. Experiment 2 was therefore conducted in order to determine if backwards reading is an effective strategy when used in combination with forwards reading.

Experiment 2

As in Experiment 1, subjects in this experiment read a series of passages containing typographical errors, and attempted to circle all the errors they could detect. However, new passages were generated for this experiment, ones for which the errors were more difficult to detect. This was done to alleviate any potential problems with ceiling effects that may have been inherent in Experiment 1.

Experiment 2 also attempted to examine the proofreading effectiveness of combining forward and backward reading. To do this, subjects proofread each passage twice, sometimes using the backward strategy and sometimes reading forwards. It was hypothesized that a combination of the two strategies (e.g., reading forwards, then backwards) would result in better error detection than using either strategy alone (e.g., reading forwards twice).

Method

Subjects. Subjects were 18 undergraduate students from psychology courses at California State University in San Bernardino. Each subject received extra course credit for volunteering to be in the experiment.

Materials. A different set of four passages was generated for Experiment 2. As in Experiment 1, the passages were selected from popular books and magazines, and each was approximately 250 words in length. However, for this experiment the typographical errors embedded within each passage were chosen to be more difficult

to detect than the errors that were used in Experiment 1. Table 2 presents an example of two of the four passages used in Experiment 2, with the typographical errors italicized. As can be seen, each passage contained a total of ten typographical errors, distributed evenly throughout the passage. Also, even though they were relatively difficult, each of the typographical errors were chosen to be noticably incorrect. In addition, all of the typographical errors were misspellings; there were no contextual errors used in this experiment.

Table 2

Two of the Passages Used in Experiment 2, with Spelling Errors Italicized

Once the prince of waterfowl in the East, black ducks are in trouble. Their population has declined steadily for 20 years. Biologists with the U.S. Fish and Wildlife Service, Canadian Wildlife Service, and state *wildife* agencies are studying the problem and have intensified *resaerch* in recent years. Meanwhile, hunters are being asked to go easy on black ducks.

The black duck is a wild duck related to the mallard duck. This excellent game bird is commonly found in eastern North America. *Unfortunatly*, its nesting and wintering habitats have been destroyed by agriculture and urban *developmemt*, and have also been further degraded by pollution. Mallard ducks have been able to adjust to these changing environments better than the black duck. Thus, as the eastern forests have disappeared, the more *adapatable* mallards have moved in. Now there's evidence that mallard ducks are breeding with black duck hens, and some biologists fear that black ducks could be breeded out of *exitsence*.

Biologists are not certain how much hunting has contributed to the black duck's decline. But from the *perpsective* of wildlife agencies, hunting is one factor we can control. Thus, hunting seasons and bag limits have been restricted. Hunter cooperation is the key, according to *biologits*, to helping this duck in distress.

Your state and federal wildlife agencies, with *assitance* from private conservation groups, are doing everything they can to bring the black ducks back. You can help by learning to *identifiy* black ducks as they come over your blind --- and then give them a break.

Health scientists have discovered that people who are *comnited* to heavy physical activity, such as jogging, can become addicted to the adrenalin "highs" that these activities lead to. This has important *implicatons* for how we exercise, because if we do not learn to 'back off' from the 'highs' that result from exercise, then the very *plaesure* we derive from even healthy endeavors can be a slow form of self- destruction.

Most people would scoff at the idea that some medication or *artifical* stimulant could ever bind them to its clutches. Yet they are totally unprepared for the *disrution* to their lives that addiction to physical activity can cause. And it can develop without their even being aware of it.

How do you tell the difference between addiction to physical activity as opposed to other problems? A good sign is having one or more of the following reactions concerning a specific physical activity: a) You feel *excitied* or encouraged only when you engage in your activity. b) When you stop *yuor* activity you feel very unhappy. c) You would rather engage in your activity than sleep. d) Your activity helps you to forget your *problens* temporarily. e) You fantasize a lot about your *acitvity* when you are away from it.

In addition to the above symptoms that have been specifically identified, there are a number of *unclassifed* problems that can result from addiction to physical activity. The more you can answer "yes" to the above statements, the greater the possibility that you are "hooked" on the high that physical activity gives you.

Procedure. Subjects were run individually. Each subject proofread all four of the passages, with the order of reading determined randomly for each subject. Subjects were instructed to read the passages quickly but accurately, and to circle all the errors they could detect. They were also informed that the errors in the passages would only consist of misspellings, and that there would be no errors based on grammar or punctuation.

Subjects proofread each passage twice, sometimes using the backward strategy and sometimes reading forwards. These combinations resulted in four experimental conditions: reading backwards twice (BB), reading forwards twice (FF), reading backward then forward (BF), and reading forward then backward (FB). Subjects proofread each of the four passages using one of these four strategies, with the order of the passages and strategies counterbalanced across subjects. Subjects were allowed to have enough time to finish each passage.

Results

For each subject, proofreading performance was determined by measuring the number of errors detected from each passage. The results of the experiment are shown in Table 3, which presents the overall proportion of errors detected for each of the four proofreading strategies. Because the passages were proofread twice, two separate measures of error detection were recorded. The top row in Table 3 presents the proportion of errors detected after the first reading of each passage. In contrast, the bottom row shows the proportion of all errors detected after the second reading. For this second measure, a typographical error was counted as detected if it had been circled on either the first reading, the second reading, or both.

A 2 X 4 repeated-measures ANOVA was conducted on these date. This analysis revealed that the number of readings had a significant effect on error detection, $F(1,17) = 81.28$, $p<.001$. Specifically, more errors were detected after two readings than after

one. But type of proofreading strategy had no significant effect on these data, $F(3,51) = 0.33$, n.s. Interestingly, there was a significant two-way interaction between these two variables, $F(3,51) = 3.54$, $p<.05$. A post-hoc analysis revealed that reading a passage twice had a larger benefit when subjects read forwards first than when they read backwards first.This is an unexpected result, but could indicate another advantage of forward over backward reading. Further research is necessary to determine if this is a replicable finding.

Table 3

Proportion of Errors Detected After One and Two Readings for Each of the Four Proofreading Strategies

	FF	BB	FB	BF
One Reading	.53	.54	.51	.58
Two Readings	.71	.63	.67	.67

General Discussion

The results of Experiment 2 basically replicate the findings of the first experiment. Overall, there was no advantage of backward over forward reading as a strategy for proofreading. In fact, the results of the experiment suggest that a better proofreading strategy is simply to read the passage more than once. In Experiment 2, the number of readings had the strongest effect on proofreading performance, with subjects detecting significantly more errors after two readings than after one. This of course is not a surprising result, since proofreaders will invariably detect a few additional errors if they read the passage more than once. This finding also replicates earlier research which shows that additional proofreading results in more error detection (Wong, 1971, 1973).

However, there was no significant effect for the type of proofreading strategy in Experiment 2. Forward reading was at least equally as effective as backward reading, and a combination of both strategies was no more effective than either strategy alone, based on a comparison of (BF and FB) vs. (BB and FF).

With the results of these experiments so negative, it may seem puzzling why backward reading is often advocated as a proofreading strategy. However, the results of Experiment 2 potentially shed some light on why the backward strategy may seem to be effective in real-life applications. As stated earlier, it is reasonable to suspect that any proofreader using the backward strategy will probably do so only after first proofreading the same passage forwards. This would be analagous to the FB condition in Experiment 2. And invariably the proofreader should detect more errors after this second, backwards reading, giving the impression that backward reading can be successfully used to catch more errors. But Experiment 2 demonstrates that two readings alone are sufficient to improve error detection, and that it doesn't matter which strategy is used in the process. Thus, reading a passage forwards twice appears to be at least equally as effective for proofreading as a combination of reading forwards and

backwards.

To summarize the major findings, the backward strategy was not shown to be an effective proofreading strategy by either of the two experiments reported here. The strategy was actually inferior to forward reading for detecting contextual errors, with no measurable benefits for detecting misspellings. A combination of reading forwards and backwards was found to be no more effective than simply reading forwards twice. Plus, despite the lack of any advantage to reading backwards, subjects often required more time to do so. Proofreaders should therefore be wary of employing this strategy when more time-efficient and more accurate alternative stategies might exist.

It is important to realize, however, that these experiments were by necessity only a first step towards studying the backward strategy. Although backward reading was not shown by these experiments to be a beneficial strategy, it may prove to have advantages under certain cicumstances. For example, subjects in these experiments were inexperienced using this method, and it may be that more practiced proofreaders might employ the backward technique more efficiently. Also, subjects were instructed in the experiments to read for accuracy, but to also read quickly. These are fairly standard instructions for proofreading experiments (c.f. Holbrook, 1978; Levy, 1983), but instructions to read quickly are contrary to most advice on proofreading (Sobolik, 1975; Weiner, 1973). Reading quickly may tend to negate any advantages of the backward strategy, since the benefit of this strategy is to slow the reader down. In the current experiments, subjects **did** in fact tend to read more slowly when reading backwards. However, they may not have reduced their speed sufficiently enough to derive any measurable benefit from reading backwards. It would therefore be desirable to replicate these experiments using more practiced subjects, and allowing them to set their own reading pace.

Clearly, then, further research is needed in this area. In addition to the backward strategy, numerous other techniques have been proposed to improve proofreading performance. These include subvocalizing or reading out loud (Kiefer, 1983; Van

Leunen, 1978, West, 1983), allowing a "cooling off" period before proofreading (Chantland, 1978; Legget, Mead, & Charvat, 1982), having other people proofread your work (Chantland, 1978; Fox, 1981; Sobolik, 1975), and having one person read out loud to another who proofreads silently (Lee, 1965; Longyear, 1983; Stevenson, 1968). Although each of these techniques has numerous advocates, almost none of them has any experimental support. More controlled research is needed to determine the best and most efficient strategies for proofreading.

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